YOUR GUIDE TO

Healthy Sleep

U.S. Department of Health and Human Services
National Institutes of Health
National Heart, Lung, and Blood Institute

SHOUT
SHARE
IT

YOUR GUIDE TO

Healthy Sleep

U.S. Department of Health and Human Services
National Institutes of Health

National Heart Lung and Blood Institute

NIH Publication No. 11-5271
Originally printed November 2005
Revised August 2011

Contents

Introduction 1

What Is Sleep? 4

What Makes You Sleep? 7

What Does Sleep Do for You? 12
- Your Learning, Memory, and Mood 12
- Your Heart 13
- Your Hormones 14

How Much Sleep Is Enough? 19

What Disrupts Sleep? 25

Is Snoring a Problem? 30

Common Sleep Disorders 33
- Insomnia 35
- Sleep Apnea 38
- Restless Legs Syndrome 47
- Narcolepsy 48
- Parasomnias (Abnormal Arousals) 51

Do You Think You Have a Sleep Disorder? 53

How To Find a Sleep Center and Sleep Specialist 56

Research 57

For More Sleep Information 60

Introduction

Think of your daily activities. Which activity is so important you should devote one-third of your time to doing it? Probably the first things that come to mind are working, spending time with your family, or doing leisure activities. But there's something else you should be doing about one-third of your time—sleeping.

Many people view sleep as merely a "down time" when their brains shut off and their bodies rest. People may cut back on sleep, thinking it won't be a problem, because other responsibilities seem much more important. But research shows that a number of vital tasks carried out during sleep help people stay healthy and function at their best.

While you sleep, your brain is hard at work forming the pathways necessary for learning and creating memories and new insights. Without enough sleep, you can't focus and pay attention or respond quickly. A lack of sleep may even cause mood problems. Also, growing evidence shows that a chronic lack of sleep increases your risk of obesity, diabetes, cardiovascular disease, and infections.

Despite growing support for the idea that adequate sleep, like adequate nutrition and physical activity, is vital to our well-being, people are sleeping less. The nonstop "24/7" nature of the world today encourages longer or nighttime work hours and offers continual access to entertainment and other activities. To keep up, people cut back on sleep.

A common myth is that people can learn to get by on little sleep (such as less than 6 hours a night) with no adverse effects. Research suggests, however, that adults need at least 7–8 hours of sleep each night to be well rested. Indeed, in 1910, most people slept 9 hours a night. But recent surveys show the average adult now sleeps fewer than 7 hours a night. More than one-third of adults report daytime sleepiness so severe that it interferes with work, driving, and social functioning at least a few days each month.

Evidence also shows that children's and adolescents' sleep is shorter than recommended. These trends have been linked to increased exposure to electronic media. Lack of sleep may have a direct effect on children's health, behavior, and development.

Chronic sleep loss or sleep disorders may affect as many as 70 million Americans. This may result in an annual cost of $16 billion in health care expenses and $50 billion in lost productivity.

What happens when you don't get enough sleep? Can you make up for lost sleep during the week by sleeping more on the weekends? How does sleep change as you become older? Is snoring a problem? How can you tell if you have a sleep disorder? Read on to find the answers to these questions and to better understand what sleep is and why it is so necessary. Learn about common sleep myths and practical tips for getting enough sleep, coping with jet lag and nighttime shift work, and avoiding dangerous drowsy driving.

Many common sleep disorders go unrecognized and thus are not treated. This booklet also gives the latest information on sleep disorders such as insomnia (trouble falling or staying asleep), sleep apnea (pauses in breathing during sleep), restless legs syndrome, narcolepsy (extreme daytime sleepiness), and parasomnias (abnormal sleep behaviors).

SZE-PING

"It's important to tell your doctor what you are experiencing, so you can help your doctor diagnose your condition."

What Is Sleep?

Sleep was long considered just a block of time when your brain and body shut down. Thanks to sleep research studies done over the past several decades, it is now known that sleep has distinct stages that cycle throughout the night in predictable patterns. How well rested you are and how well you function depend not just on your total sleep time but on how much sleep you get each night and the timing of your sleep stages.

Your brain and body functions stay active throughout sleep, and each stage of sleep is linked to a specific type of brain waves (distinctive patterns of electrical activity in the brain).

Sleep is divided into two basic types: rapid eye movement (REM) sleep and non-REM sleep (with three different stages). (For more information, see "Types of Sleep" on page 5.) Typically, sleep begins with non-REM sleep. In stage 1 non-REM sleep, you sleep lightly and can be awakened easily by noises or other disturbances. During this first stage of sleep, your eyes move slowly, your muscles relax, and your heart and breathing rates begin to slow. You then enter stage 2 non-REM sleep, which is defined by slower brain waves with occasional bursts of rapid waves. You spend about half the night in this stage.

When you progress into stage 3 non-REM sleep, your brain waves become even slower, and the brain produces extremely slow waves almost exclusively (called Delta waves).

Stage 3 is a very deep stage of sleep, during which it is very difficult to be awakened. Children who wet the bed or sleep walk tend to do so during stage 3 of non-REM sleep. Deep sleep is considered the "restorative" stage of sleep that is necessary for feeling well rested and energetic during the day.

Types of Sleep

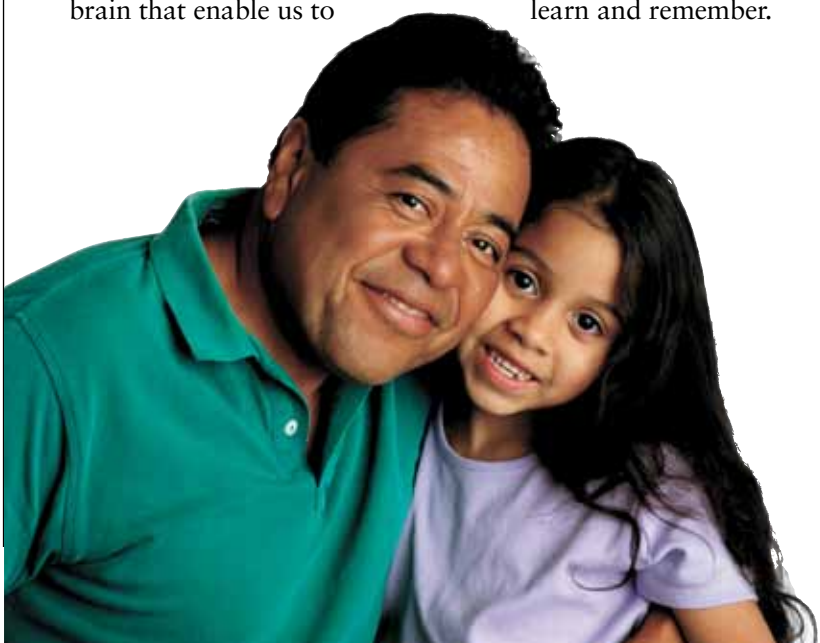
Non-REM Sleep		REM Sleep
Stage 1:	Light sleep; easily awakened; muscles relax with occasional twitches; eye movements are slow.	• Usually first occurs about 90 minutes after you fall asleep, and longer, deeper periods occur during the second half of the night; cycles along with the non-REM stages throughout the night. • Eyes move rapidly behind closed eyelids. • Breathing, heart rate, and blood pressure are irregular. • Dreaming occurs. • Arm and leg muscles are temporarily paralyzed.
Stage 2:	Eye movements stop; slower brain waves, with occasional bursts of rapid brain waves.	
Stage 3:	Occurs soon after you fall asleep and mostly in the first half of the night. Deep sleep; difficult to awaken; large slow brain waves, heart and respiratory rates are slow and muscles are relaxed.	

Types of Sleep

During REM sleep, your eyes move rapidly in different directions, even though your eyelids stay closed. Your breathing also becomes more rapid, irregular, and shallow, and your heart rate and blood pressure increase. Dreaming typically occurs during REM sleep. During this type of sleep, your arm and leg muscles are temporarily paralyzed so that you cannot "act out" any dreams that you may be having.

You typically first enter REM sleep about an hour to an hour and a half after falling asleep. After that, the sleep stages repeat themselves continuously while you sleep. As you sleep, REM sleep time becomes longer, while time spent in stage 3 non-REM sleep becomes shorter. By the time you wake up, nearly all your sleep time has been spent in stages 1 and 2 of non-REM sleep and in REM sleep. If REM sleep is severely disrupted during one night, REM sleep time is typically longer than normal in subsequent nights until you catch up. Overall, almost one-half of your total sleep time is spent in stage 2 non-REM sleep and about one-fifth each in deep sleep (stage 3 of non-REM sleep) and REM sleep. In contrast, infants spend half or more of their total sleep time in REM sleep. Gradually, as they grow, the percentage of total sleep time they spend in REM continues to decrease, until it reaches the one-fifth level typical of later childhood and adulthood.

Why people dream and why REM sleep is so important are not well understood. It is known that REM sleep stimulates the brain regions you use to learn and make memories. Animal studies suggest that dreams may reflect the brain's sorting and selectively storing new information acquired during wake time. While this information is processed, the brain might revisit scenes from the day and mix them randomly. Dreams are generally recalled when we wake briefly or are awakened by an alarm clock or some other noise in the environment. Studies show, however, that other stages of sleep besides REM also are needed to form the pathways in the brain that enable us to learn and remember.



What Makes You Sleep?

Although you may put off going to sleep in order to squeeze more activities into your day, eventually your need for sleep becomes overwhelming. This need appears to be due, in part, to two substances your body produces. One substance, called adenosine, builds up in your blood while you're awake. Then, while you sleep, your body breaks down the adenosine. Levels of this substance in your body may help trigger sleep when needed.

A buildup of adenosine and many other complex factors might explain why, after several nights of less than optimal amounts of sleep, you build up a sleep debt. This may cause you to sleep longer than normal or at unplanned times during the day. Because of your body's internal processes, you can't adapt to getting less sleep than your body needs. Eventually, a lack of sleep catches up with you.

The other substance that helps make you sleep is a hormone called melatonin. This hormone makes you naturally feel sleepy at night. It is part of your internal "biological clock," which controls when you feel sleepy and your sleep patterns. Your biological clock is a small bundle of cells in your brain that works throughout the day and night. Internal and external environmental cues, such as light signals received through your eyes, control these cells. Your biological clock triggers your body to produce melatonin, which helps prepare your brain and body for sleep. As melatonin is released, you'll feel increasingly drowsy. Because of your biological clock, you naturally feel the most tired between midnight and 7 a.m. You also may feel mildly sleepy in the afternoon between 1 p.m. and 4 p.m. when another increase in melatonin occurs in your body.

Your biological clock makes you the most alert during daylight hours and the least alert during the early morning hours. Consequently, most people do their best work during the day. Our 24/7 society, however, demands that some people work at night. Nearly one-quarter of all workers work shifts that are not during the daytime, and more than two-thirds of these workers have problem sleepiness and/or difficulty sleeping. Because their work schedules

are at odds with powerful sleep-regulating cues like sunlight, night shift workers often find themselves drowsy at work, and they have difficulty falling or staying asleep during the daylight hours when their work schedules require them to sleep.

The fatigue experienced by night shift workers can be dangerous. Major industrial accidents—such as the Three Mile Island and Chernobyl nuclear power plant accidents and the Exxon Valdez oil spill—have been caused, in part, by mistakes made by overly tired workers on the night shift or an extended shift.

Night shift workers also are at greater risk of being in car crashes when they drive home from work during the early morning hours, because the biological clock is not sending out an alerting signal. One study found that one-fifth of night shift workers had a car crash or a near miss in the preceding year because of sleepiness on the drive home from work. Night shift workers are also more likely to have physical problems, such as heart disease, digestive troubles, and infertility, as well as emotional problems. All of these problems may be related, at least in part, to the workers' chronic sleepiness, possibly because their biological clocks are not in tune with their work schedules. See "Working the Night Shift" on page 9 for some helpful tips if you work a night shift.

Other factors also can influence your need for sleep, including your immune system's production of hormones called cytokines. Cytokines are made to help the immune system fight certain infections or chronic inflammation and may prompt you to sleep more than usual. The extra sleep may help you conserve the resources needed to fight the infection. Recent studies confirm that being well rested improves the body's responses to infection.

People are creatures of habit, and one of the hardest habits to break is the natural wake and sleep cycle. Together, a number of physiological factors help you sleep and wake up at the same times each day.

Consequently, you may have a hard time adjusting when you travel across time zones. The light cues outside and the clocks in your new location may tell you it is 8 a.m. and you should be active, but your body is telling you it is more like 4 a.m. and you should sleep. The end result is jet lag—sleepiness during the day, difficulty falling or staying asleep at night, poor concentration, confusion, nausea, and generally feeling unwell and irritable. See "Dealing With Jet Lag" on page 10.

Working the Night Shift

Try to limit night shift work, if that is possible. If you must work the night shift, the following tips may help you:

- Increase your total amount of sleep by adding naps and lengthening the amount of time you allot for sleep.
- Use bright lights in your workplace.
- Minimize the number of shift changes so that your body's biological clock has a longer time to adjust to a nighttime work schedule.
- Get rid of sound and light distractions in your bedroom during your daytime sleep.
- Use caffeine only during the first part of your shift to promote alertness at night.

If you are unable to fall asleep during the day, and all else fails, talk with your doctor to see whether it would be wise for you to use prescribed, short-acting sleeping pills to help you sleep during the day.

Night Shift

Dealing With Jet Lag

Be aware that adjusting to a new time zone may take several days. If you are going to be away for just a few days, it may be better to stick to your original sleep and wake times as much as possible, rather than adjusting your biological clock too many times in rapid succession.

Eastward travel generally causes more severe jet lag than westward travel because traveling east requires you to shorten the day, and your biological clock is better able to adjust to a longer day than a shorter day. Fortunately for globetrotters, a few preventive measures and adjustments seem to help some people relieve jet lag, particularly when they are going to spend more than a few days at their destination:

- **Adjust your biological clock.** During the 2–3 days prior to a long trip, get adequate sleep. You can make minor changes to your sleep schedule. For example, if you are traveling west, delay your bed time and wake time progressively by 20- to 30-minute intervals. If you are traveling east, advance your wake time by 10 to 15 minutes a day for a few days and try to advance your bed time. Decreasing light exposure at bedtime and increasing light exposure at wake time can help you make these adjustments. When you arrive at your destination, spend a lot of time outdoors so your body gets the light cues it needs to adjust to the new time zone. Take a couple of short 10–15 minute catnaps if you feel tired, but do not take long naps during the day.
- **Avoid alcohol and caffeine.** Although it may be tempting to drink alcohol to relieve the stress of travel and make it easier to fall asleep, you're more likely to sleep lighter and wake up in the middle of the night when the effects of the alcohol wear off. Caffeine can help keep you awake longer, but caffeine also can make it harder for you to fall asleep if its effects haven't worn off by the time you are ready to go to bed. Therefore, it's best to use caffeine only during the morning and not during the afternoon.

- **What about melatonin?** Your body produces this hormone that may cause some drowsiness and cues the brain and body that it is time to fall asleep. Melatonin builds up in your body during the early evening and into the first 2 hours of your sleep period, and then its release stops in the middle of the night.

  Melatonin is available as an over-the-counter supplement. Because melatonin is considered safe when used over a period of days or weeks and seems to help people feel sleepy, it has been suggested as a treatment for jet lag. But melatonin's effectiveness is controversial, and its safety when used over a prolonged period is unclear. Some studies find that taking melatonin supplements before bedtime for several days after arrival in a new time zone can make it easier to fall asleep at the proper time. Other studies find that melatonin does not help relieve jet lag.

Jet Lag

What Does Sleep Do for You?

A number of aspects of your health and quality of life are linked to sleep, and these aspects are impaired when you are sleep deprived.

Your Learning, Memory, and Mood

Students who have trouble grasping new information or learning new skills are often advised to "sleep on it," and that advice seems well founded. Recent studies reveal that people can learn a task better if they are well rested. They also can better remember what they learned if they get a good night's sleep after learning the task than if they are sleep deprived. Study volunteers had to sleep at least 6 hours to show improvement in learning. Additionally, the amount of improvement was directly related to how much time they slept—for example, volunteers who slept 8 hours outperformed those who slept only 6 or 7 hours. Other studies suggest that it's important to get enough rest the night before a mentally challenging task, rather than only sleeping for a short period or waiting to sleep until after the task is complete.

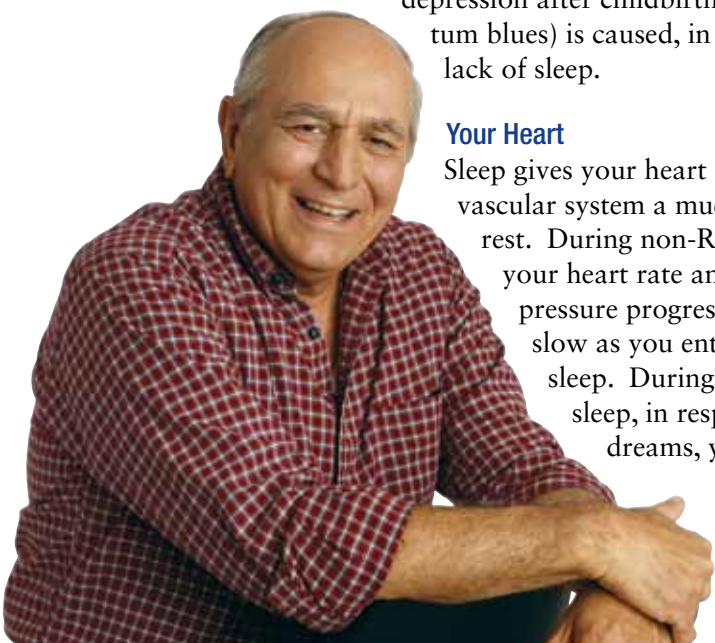
Many well-known artists and scientists claim to have had creative insights while they slept. Mary Shelley, for example, said the idea for her novel *Frankenstein* came to her in a dream. Although it has not been shown that dreaming is the driving force behind innovation, one study suggests that sleep is needed for creative problem-solving. In that study, volunteers were asked to perform a memory task and then were tested on it 8 hours later. Those who were allowed to sleep for 8 hours immediately after trying the task and before being tested were much more likely to find a creative way of simplifying the task and improving their performance, compared with those who were awake the entire 8 hours before being tested.

Exactly what happens during sleep to improve our learning, memory, and insight isn't known. Experts suspect, however, that while

people sleep, they form or strengthen the pathways of brain cells needed to perform these tasks. This process may explain why sleep is needed for proper brain development in infants.

Not only is a good night's sleep required to form new learning and memory pathways in the brain, but also sleep is necessary for those pathways to work well. Several studies show that lack of sleep causes thinking processes to slow down. Lack of sleep also makes it harder to focus and pay attention. Lack of sleep can make you more easily confused. Studies also find that a lack of sleep leads to faulty decisionmaking and more risk taking. A lack of sleep slows down your reaction time, which is particularly important to driving and other tasks that require quick response. When people who lack sleep are tested on a driving simulator, they perform just as poorly as people who are drunk. (See "Crash in Bed, Not on the Road" on page 16.) The bottom line is: Not getting a good night's sleep can be dangerous!

Even if you don't have a mentally or physically challenging day ahead of you, you should still get enough sleep to put yourself in a good mood. Most people report being irritable, if not downright unhappy, when they lack sleep. People who chronically suffer from a lack of sleep, either because they do not spend enough time in bed or because they have an untreated sleep disorder, are at greater risk of developing depression. One group of people who usually don't get enough sleep is mothers of newborns. Some experts think depression after childbirth (postpartum blues) is caused, in part, by a lack of sleep.



Your Heart

Sleep gives your heart and vascular system a much-needed rest. During non-REM sleep, your heart rate and blood pressure progressively slow as you enter deeper sleep. During REM sleep, in response to dreams, your heart

and breathing rates can rise and fall and your blood pressure can be variable. These changes throughout the night in blood pressure and heart and breathing rates seem to promote cardiovascular health.

If you don't get enough sleep, the nightly dip in blood pressure that appears to be important for good cardiovascular health may not occur. Failure to experience the normal dip in blood pressure during sleep can be related to insufficient sleep time, an untreated sleep disorder (for example, sleep apnea), or other factors. Some sleep-related abnormalities may be markers of heart disease and increased risk of stroke.

A lack of sleep also puts your body under stress and may trigger the release of more adrenaline, cortisol, and other stress hormones during the day. These hormones keep your blood pressure from dipping during sleep, which increases your risk for heart disease. Lack of sleep also may trigger your body to produce more of certain proteins thought to play a role in heart disease. For example, some studies find that people who repeatedly don't get enough sleep have higher than normal blood levels of C-reactive protein, a sign of inflammation. High levels of this protein may indicate an increased risk for a condition called atherosclerosis, or hardening of the arteries.

Your Hormones

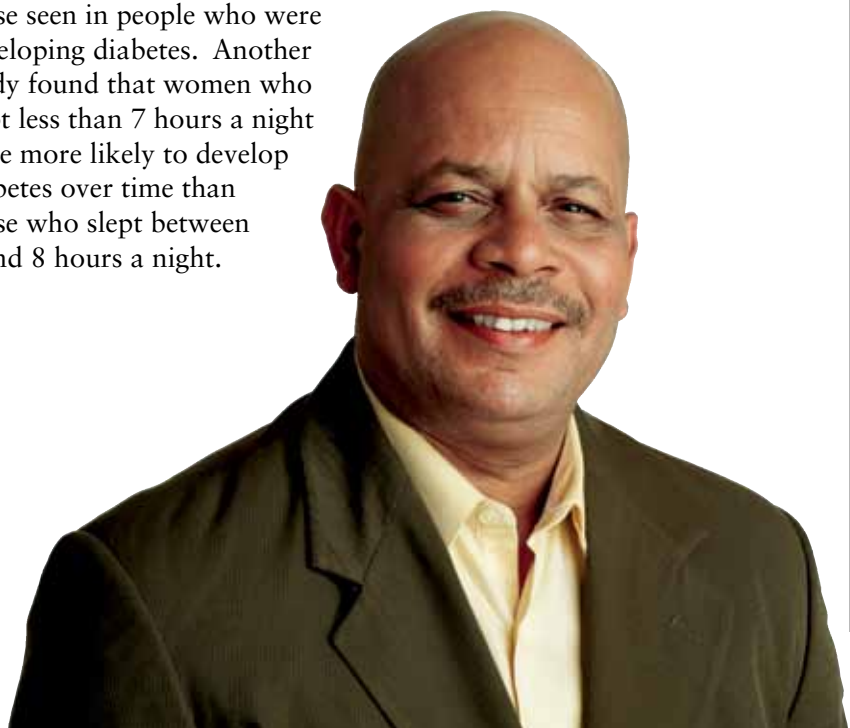
When you were young, your mother may have told you that you need to get enough sleep to grow strong and tall. She may have been right! Deep sleep (stage 3 non-REM sleep) triggers more release of growth hormone, which contributes to growth in children and boosts muscle mass and the repair of cells and tissues in children and adults. Sleep's effect on the release of sex hormones also contributes to puberty and fertility. Consequently, women who work at night and tend to lack sleep may be at increased risk of miscarriage.

Your mother also probably was right if she told you that getting a good night's sleep on a regular basis would help keep you from getting sick and help you get better if you do get sick. During sleep, your body creates more cytokines—cellular hormones that help the immune system fight various infections. Lack of sleep can reduce your body's ability to fight off common infections. Research also reveals that a lack of sleep can reduce the body's response to the flu

vaccine. For example, sleep-deprived volunteers given the flu vaccine produced less than half as many flu antibodies as those who were well rested and given the same vaccine.

Although lack of exercise and other factors also contribute, the current epidemic of diabetes and obesity seems to be related, at least in part, to chronically short or disrupted sleep or not sleeping during the night. Evidence is growing that sleep is a powerful regulator of appetite, energy use, and weight control. During sleep, the body's production of the appetite suppressor *leptin* increases, and the appetite stimulant *grehlin* decreases. Studies find that the less people sleep, the more likely they are to be overweight or obese and prefer eating foods that are higher in calories and carbohydrates. People who report an average total sleep time of 5 hours a night, for example, are much more likely to become obese, compared with people who sleep 7–8 hours a night.

A number of hormones released during sleep also control the body's use of energy. A distinct rise and fall of blood sugar levels during sleep appears to be linked to sleep stages. Not sleeping at the right time, not getting enough sleep overall, or not enough of each stage of sleep disrupts this pattern. One study found that, when healthy young men slept only 4 hours a night for 6 nights in a row, their insulin and blood sugar levels matched those seen in people who were developing diabetes. Another study found that women who slept less than 7 hours a night were more likely to develop diabetes over time than those who slept between 7 and 8 hours a night.



Crash in Bed

Not on the Road

Most people are aware of the hazards of drunk driving. But driving while sleepy can be just as dangerous. Indeed, crashes due to sleepy drivers are as deadly as those due to drivers impaired by alcohol. And you don't have to be asleep at the wheel to put yourself and others in danger. Both alcohol and a lack of sleep limit your ability to react quickly to a suddenly braking car, a sharp curve in the road, or other situations that require rapid responses. Just a few seconds' delay in reaction time can be a life-or-death matter when driving. When people who lack sleep are tested on a driving simulator, they perform as badly as or worse than those who are drunk. The combination of alcohol and lack of sleep can be especially dangerous. There is increasing evidence that sleep deprivation and inexperience behind the wheel, both particularly common in adolescents, is a lethal combination.

Of course, driving is also hazardous if you fall asleep at the wheel, which happens surprisingly often. One-quarter of the drivers surveyed in New York State reported they had fallen asleep at the wheel at some time. Often, people briefly nod off at the wheel without being aware of it—they just can't recall what happened over the previous few seconds or longer. And people who lack sleep are more apt to take risks and make poor judgments, which also can boost their chances of getting in a car crash.

Opening a window or turning up the radio won't help you stay awake while driving. The bottom line is that there is no substitute for sleep. Be aware of these warning signs that you are too sleepy to drive safely: trouble keeping your eyes open or focused, continual yawning, or being unable to recall driving the past few miles. Remember, if you are short on sleep, stay out of the driver's seat!

Here are some potentially life-saving tips for avoiding drowsy driving:

- **Be well rested before hitting the road.** If you have several nights in a row of fewer than 7–8 hours of sleep, your reaction time slows. Restoring that reaction time to normal can take more than one night of good sleep, because a sleep debt accumulates after each night you lose sleep. It may take several nights of being well rested to repay that sleep debt and make you ready for driving on a long road trip.
- **Avoid driving between midnight and 7 a.m.** Unless you are accustomed to being awake then, this period of time is when we are naturally the least alert and most tired.
- **Don't drive alone.** A companion who can keep you engaged in conversation might help you stay awake while driving.
- **Schedule frequent breaks on long road trips.** If you feel sleepy while driving, pull off the road and take a nap for 15–20 minutes.
- **Don't drink alcohol.** Just one beer when you are sleep deprived will affect you as much as two or three beers when you are well rested.
- **Don't count on caffeine or other tricks.** Although drinking a cola or a cup of coffee might help keep you awake for a short time, it won't overcome extreme sleepiness or relieve a sleep debt.

DAPHNE

"I wake up early to get ready for school. I am tired in the morning, and by the end of the school day, I am very tired again. An afterschool nap seems to refresh me and help me focus on homework. Without it, I am grumpy and stressed, can't focus, and sometimes get headaches."

How Much Sleep Is Enough?

Animal studies suggest that sleep is as vital as food for survival. Rats, for example, normally live 2–3 years, but they live only 5 weeks if they are deprived of REM sleep and only 2–3 weeks if they are deprived of all sleep stages—a timeframe similar to death due to starvation. But how much sleep do humans need? To help answer that question, scientists look at how much people sleep when unrestricted, the average amount of sleep among various age groups, and the amount of sleep that studies reveal is necessary to function at your best.

When healthy adults are given unlimited opportunity to sleep, they sleep on average between 8 and 8.5 hours a night. But sleep needs vary from person to person. Some people appear to need only about 7 hours to avoid problem sleepiness, whereas others need 9 or more hours of sleep. Sleep needs also change throughout the life cycle. Newborns sleep between 16 and 18 hours a day, and children in preschool sleep between 11 and 12 hours a day. School-aged children and adolescents need at least 10 hours of sleep each night.

The hormonal influences of puberty tend to shift adolescents' biological clocks. As a result, teenagers (who need between 9 and 10 hours of sleep a night) are more likely to go to bed later than younger children and adults, and they tend to want to sleep later in the morning. This delayed sleep–wake rhythm conflicts with the early-morning start times of many high schools and helps explain why most teenagers get an average of only 7–7.5 hours of sleep a night.

As people get older, the pattern of sleep also changes—especially the amount of time spent in deep sleep. This explains why children can sleep through loud noises and why they might not wake up when moved. Across the lifespan, the sleep period tends to advance, namely relative to teenagers; older adults tend to go to bed earlier and wake earlier. The quality—but not necessarily the quantity—of

deep, non-REM sleep also changes, with a trend toward lighter sleep. The relative percentages of stages of sleep appear to stay mostly constant after infancy. From midlife through late life, people awaken more throughout the night. These sleep disruptions cause older people to lose more and more of stages 1 and 2 non-REM sleep as well as REM sleep.

Some older people complain of difficulty falling asleep, early morning awakenings, frequent and long awakenings during the night, daytime sleepiness, and a lack of refreshing sleep. Many sleep problems, however, are not a natural part of sleep in the elderly. Their sleep complaints may be due, in part, to medical conditions, illnesses, or medications they are taking—all of which can disrupt sleep. In fact, one study found that the prevalence of sleep problems is very low in healthy older adults. Other causes of some of older adults' sleep complaints are sleep apnea, restless legs syndrome, and other sleep disorders that become more common with age. Also, older people are more likely to have their sleep disrupted by the need to urinate during the night.

Some evidence shows that the biological clock shifts in older people, so they are more apt to go to sleep earlier at night and wake up earlier in the morning. No evidence indicates that older people can get by with less sleep than younger people. (See "Top 10 Sleep Myths" on page 22.) Poor sleep in older people may result in excessive daytime sleepiness, attention and memory problems, depressed mood, and overuse of sleeping pills.

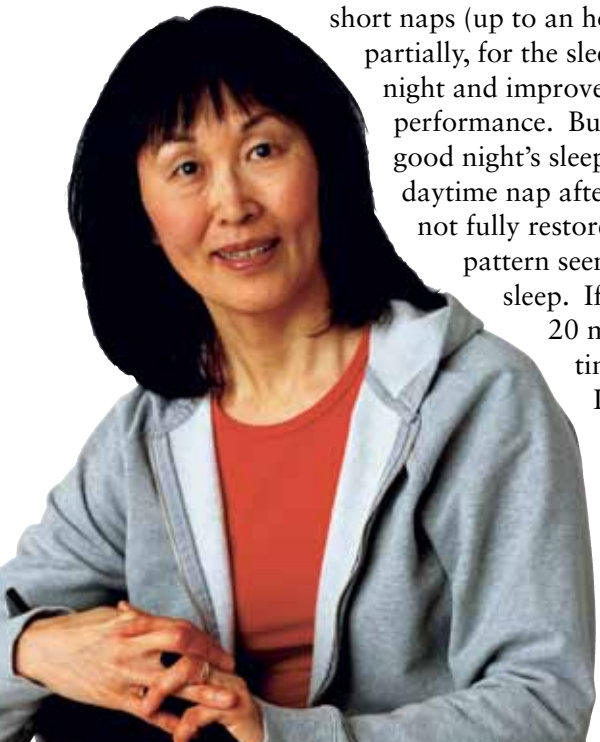
Despite variations in sleep quantity and quality, both related to age and

between individuals, studies suggest that the optimal amount of sleep needed to perform adequately, avoid a sleep debt, and not have problem sleepiness during the day is about 7–8 hours for adults and at least 10 hours for school-aged children and adolescents. Similar amounts seem to be necessary to avoid an increased risk of developing obesity, diabetes, or cardiovascular diseases.

Quality of sleep and the timing of sleep are as important as quantity. People whose sleep is frequently interrupted or cut short may not get enough of both non-REM sleep and REM sleep. Both types of sleep appear to be crucial for learning and memory—and perhaps for the restorative benefits of healthy sleep, including the growth and repair of cells.

Many people try to make up for lost sleep during the week by sleeping more on the weekends. But if you have lost too much sleep, sleeping in on a weekend does not completely erase your sleep debt. Certainly, sleeping more at the end of a week won't make up for any poor performance you had earlier in that week. Just one night of inadequate sleep can negatively affect your functioning and mood during at least the next day.

Daytime naps are another strategy some people use to make up for lost sleep during the night. Some evidence shows that short naps (up to an hour) can make up, at least partially, for the sleep missed on the previous night and improve alertness, mood, and work performance. But naps don't substitute for a good night's sleep. One study found that a daytime nap after a lack of sleep at night did not fully restore levels of blood sugar to the pattern seen with adequate nighttime sleep. If a nap lasts longer than 20 minutes, you may have a hard time waking up fully. In addition, late afternoon naps can make falling asleep at night more difficult.



Top 10 Sleep Myths

Myth 1: Sleep is a time when your body and brain shut down for rest and relaxation. No evidence shows that any major organ (including the brain) or regulatory system in the body shuts down during sleep. Some physiological processes actually become more active while you sleep. For example, secretion of certain hormones is boosted, and activity of the pathways in the brain linked to learning and memory increases.

Myth 2: Getting just 1 hour less sleep per night than needed will not have any effect on your daytime functioning. This lack of sleep may not make you noticeably sleepy during the day. But even slightly less sleep can affect your ability to think properly and respond quickly, and it can impair your cardiovascular health and energy balance as well as your body's ability to fight infections, particularly if lack of sleep continues. If you consistently do not get enough sleep, a sleep debt builds up that you can never repay. This sleep debt affects your health and quality of life and makes you feel tired during the day.

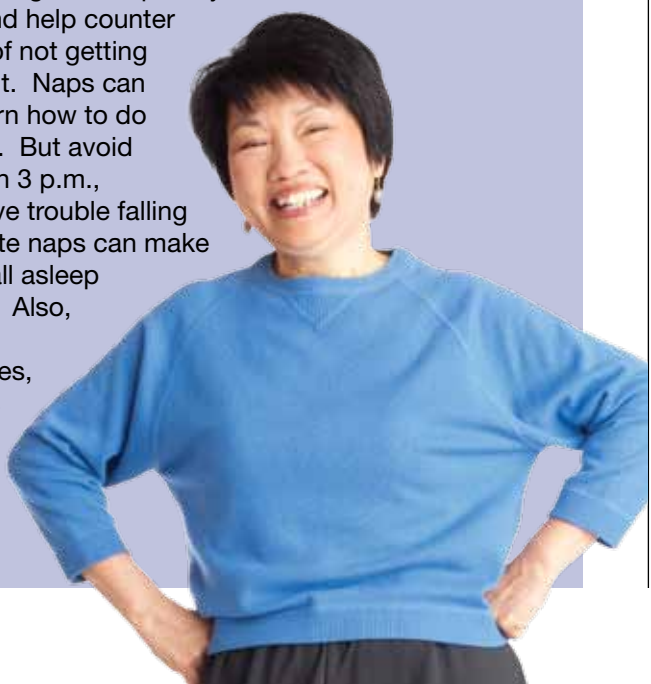
Myth 3: Your body adjusts quickly to different sleep schedules. Your biological clock makes you most alert during the daytime and least alert at night. Thus, even if you work the night shift, you will naturally feel sleepy when nighttime comes. Most people can reset their biological clock, but only by appropriately timed cues—and even then, by 1–2 hours per day at best. Consequently, it can take more than a week to adjust to a substantial change in your sleep–wake cycle—for example, when traveling across several time zones or switching from working the day shift to the night shift.

Myth 4: People need less sleep as they get older. Older people don't need less sleep, but they may get less sleep or find their sleep less refreshing. That's because as people age, the quality of their sleep changes. Older people are also more likely to have insomnia or other medical conditions that disrupt their sleep.

Myth 5: Extra sleep for one night can cure you of problems with excessive daytime fatigue. Not only is the quantity of sleep important, but also the quality of sleep. Some people sleep 8 or 9 hours a night but don't feel well rested when they wake up because the quality of their sleep is poor. A number of sleep disorders and other medical conditions affect the quality of sleep. Sleeping more won't lessen the daytime sleepiness these disorders or conditions cause. However, many of these disorders or conditions can be treated effectively with changes in behavior or with medical therapies. Additionally, one night of increased sleep may not correct multiple nights of inadequate sleep.

Myth 6: You can make up for lost sleep during the week by sleeping more on the weekends. Although this sleeping pattern will help you feel more rested, it will not completely make up for the lack of sleep or correct your sleep debt. This pattern also will not necessarily make up for impaired performance during the week or the physical problems that can result from not sleeping enough. Furthermore, sleeping later on the weekends can affect your biological clock, making it much harder to go to sleep at the right time on Sunday nights and get up early on Monday mornings.

Myth 7: Naps are a waste of time. Although naps are no substitute for a good night's sleep, they can be restorative and help counter some of the effects of not getting enough sleep at night. Naps can actually help you learn how to do certain tasks quicker. But avoid taking naps later than 3 p.m., particularly if you have trouble falling asleep at night, as late naps can make it harder for you to fall asleep when you go to bed. Also, limit your naps to no longer than 20 minutes, because longer naps will make it harder to wake up and



Top 10 Sleep Myths (continued)

get back in the swing of things. If you take more than one or two planned or unplanned naps during the day, you may have a sleep disorder that should be treated.

Myth 8: Snoring is a normal part of sleep. Snoring during sleep is common, particularly as a person gets older. Evidence is growing that snoring on a regular basis can make you sleepy during the day and increase your risk for diabetes and heart disease. In addition, some studies link frequent snoring to problem behavior and poorer school achievement in children. Loud, frequent snoring also can be a sign of sleep apnea, a serious sleep disorder that should be evaluated and treated. (See "Is Snoring a Problem?" on page 30.)

Myth 9: Children who don't get enough sleep at night will show signs of sleepiness during the day. Unlike adults, children who don't get enough sleep at night typically become hyperactive, irritable, and inattentive during the day. They also have increased risk of injury and more behavior problems, and their growth rate may be impaired. Sleep debt appears to be quite common during childhood and may be misdiagnosed as attention-deficit hyperactivity disorder.

Myth 10: The main cause of insomnia is worry. Although worry or stress can cause a short bout of insomnia, a persistent inability to fall asleep or stay asleep at night can be caused by a number of other factors. Certain medications and sleep disorders can keep you up at night. Other common causes of insomnia are depression, anxiety disorders, and asthma, arthritis, or other medical conditions with symptoms that tend to be troublesome at night. Some people who have chronic insomnia also appear to be more "revved up" than normal, so it is harder for them to fall asleep.

Sleep Myths

What Disrupts Sleep?

Many factors can prevent a good night's sleep. These factors range from well-known stimulants, such as coffee, to certain pain relievers, decongestants, and other culprits. Many people depend on the caffeine in coffee, cola, or tea to wake them up in the morning or to keep them awake. Caffeine is thought to block the cell receptors that adenosine (a substance in the brain) uses to trigger its sleep-inducing signals. In this way, caffeine fools the body into thinking it isn't tired. It can take as long as 6–8 hours for the effects of caffeine to wear off completely. Thus, drinking a cup of coffee in the late afternoon may prevent your falling asleep at night.

Nicotine is another stimulant that can keep you awake. Nicotine also leads to lighter than normal sleep, and heavy smokers tend to wake up too early because of nicotine withdrawal. Although alcohol is a sedative that makes it easier to fall asleep, it prevents deep sleep and REM sleep, allowing only the lighter stages of sleep. People who drink alcohol also tend to wake up in the middle of the night when the effects of an alcoholic "nightcap" wear off.

Certain commonly used prescription and over-the-counter medicines contain ingredients that can keep you awake. These ingredients include decongestants and steroids. Many medicines taken to relieve headaches contain caffeine. Heart and blood pressure medications known as beta blockers can make it difficult to fall asleep and cause more awakenings during the night. People who have chronic asthma or bronchitis also have more problems falling asleep and staying asleep than healthy people, either because of their breathing difficulties or because of the medicines

SZE-PING

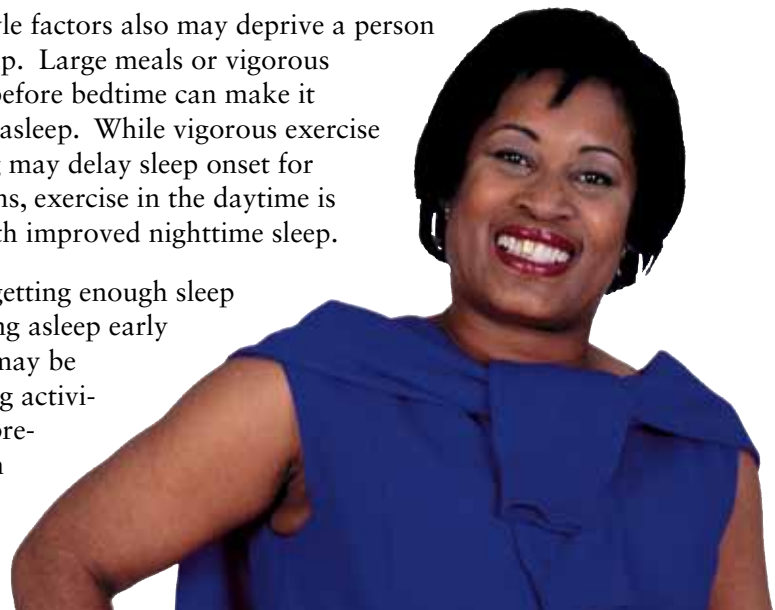
"When medicines didn't work for me, I started making big lifestyle changes. Now I try to eat a balanced diet and walk for at least an hour each day. Without doubt, my weight loss and more active lifestyle help me sleep better."

they take. Other chronic painful or uncomfortable conditions—such as arthritis, congestive heart failure, and sickle cell anemia—can disrupt sleep, too.

A number of psychological disorders—including schizophrenia, bipolar disorder, and anxiety disorders—are well known for disrupting sleep. Depression often leads to insomnia, and insomnia can cause depression. Some of these psychological disorders are more likely to disrupt REM sleep. Psychological stress also takes its toll on sleep, making it more difficult to fall asleep or stay asleep. People who feel stressed also tend to spend less time in deep sleep and REM sleep. Many people report having difficulties sleeping if, for example, they have recently lost a loved one, are going through a divorce, or are under stress at work.

Menstrual cycle hormones can affect how well women sleep. Progesterone is known to induce sleep and circulates in greater concentrations in the second half of the menstrual cycle. For this reason, women may sleep better during this phase of their menstrual cycle. On the other hand, many women report trouble sleeping the night before their menstrual flow starts. This sleep disruption may be related to the abrupt drop in progesterone levels that occurs just before menstruation. Women in their late forties and early fifties, however, report more difficulties sleeping (insomnia) than younger women. These difficulties may be linked to menopause, when they have lower concentrations of progesterone. Hot flashes in women of this age also may cause sleep disruption and difficulties.

Certain lifestyle factors also may deprive a person of needed sleep. Large meals or vigorous exercise just before bedtime can make it harder to fall asleep. While vigorous exercise in the evening may delay sleep onset for various reasons, exercise in the daytime is associated with improved nighttime sleep.



If you aren't getting enough sleep or aren't falling asleep early enough, you may be overscheduling activities that can prevent you from getting the

quiet relaxation time you need to prepare for sleep. Most people report that it's easier to fall asleep if they have time to wind down into a less active state before sleeping. Relaxing in a hot bath or having a hot, caffeine-free beverage before bedtime may help. In addition, your body temperature drops after a hot bath in a way that mimics, in part, what happens as you fall asleep. Probably for both these reasons, many people report that they fall asleep more easily after a hot bath.

Your sleeping environment also can affect your sleep. Clear your bedroom of any potential sleep distractions, such as noises, bright lights, a TV, a cell phone, or computer. Having a comfortable mattress and pillow can help promote a good night's sleep. You also sleep better if the temperature in your bedroom is kept on the cool side. For more ideas on improving your sleep, check out the tips for getting a good night's sleep below.

Tips for Getting a Good Night's Sleep

- **Stick to a sleep schedule.** Go to bed and wake up at the same time each day. As creatures of habit, people have a hard time adjusting to changes in sleep patterns. Sleeping later on weekends won't fully make up for a lack of sleep during the week and will make it harder to wake up early on Monday morning.
- **Exercise is great, but not too late in the day.** Try to exercise at least 30 minutes on most days but not later than 2–3 hours before your bedtime.
- **Avoid caffeine and nicotine.** Coffee, colas, certain teas, and chocolate contain the stimulant caffeine, and its effects can take as long as 8 hours to wear off fully. Therefore, a cup of coffee in the late afternoon can make it hard for you to fall asleep at night. Nicotine is also a stimulant, often causing smokers to sleep only very lightly. In addition, smokers often wake up too early in the morning because of nicotine withdrawal.

Tips for Getting a Good Night's Sleep (continued)

- **Avoid alcoholic drinks before bed.** Having a "nightcap" or alcoholic beverage before sleep may help you relax, but heavy use robs you of deep sleep and REM sleep, keeping you in the lighter stages of sleep. Heavy alcohol ingestion also may contribute to impairment in breathing at night. You also tend to wake up in the middle of the night when the effects of the alcohol have worn off.
- **Avoid large meals and beverages late at night.** A light snack is okay, but a large meal can cause indigestion that interferes with sleep. Drinking too many fluids at night can cause frequent awakenings to urinate.
- **If possible, avoid medicines that delay or disrupt your sleep.** Some commonly prescribed heart, blood pressure, or asthma medications, as well as some over-the-counter and herbal remedies for coughs, colds, or allergies, can disrupt sleep patterns. If you have trouble sleeping, talk to your doctor or pharmacist to see whether any drugs you're taking might be contributing to your insomnia and ask whether they can be taken at other times during the day or early in the evening.
- **Don't take naps after 3 p.m.** Naps can help make up for lost sleep, but late afternoon naps can make it harder to fall asleep at night.
- **Relax before bed.** Don't overschedule your day so that no time is left for unwinding. A relaxing activity, such as reading or listening to music, should be part of your bedtime ritual.
- **Take a hot bath before bed.** The drop in body temperature after getting out of the bath may help you feel sleepy, and the bath can help you relax and slow down so you're more ready to sleep.
- **Have a good sleeping environment.** Get rid of anything in your bedroom that might distract you from sleep, such as noises, bright lights, an uncomfortable bed, or warm temperatures. You sleep better if the temperature in the room

is kept on the cool side. A TV, cell phone, or computer in the bedroom can be a distraction and deprive you of needed sleep. Having a comfortable mattress and pillow can help promote a good night's sleep. Individuals who have insomnia often watch the clock. Turn the clock's face out of view so you don't worry about the time while trying to fall asleep.

- **Have the right sunlight exposure.** Daylight is key to regulating daily sleep patterns. Try to get outside in natural sunlight for at least 30 minutes each day. If possible, wake up with the sun or use very bright lights in the morning. Sleep experts recommend that, if you have problems falling asleep, you should get an hour of exposure to morning sunlight and turn down the lights before bedtime.
- **Don't lie in bed awake.** If you find yourself still awake after staying in bed for more than 20 minutes or if you are starting to feel anxious or worried, get up and do some relaxing activity until you feel sleepy. The anxiety of not being able to sleep can make it harder to fall asleep.
- **See a doctor if you continue to have trouble sleeping.** If you consistently find it difficult to fall or stay asleep and/or feel tired or not well rested during the day despite spending enough time in bed at night, you may have a sleep disorder. Your family doctor or a sleep specialist should be able to help you, and it is important to rule out other health or psychiatric problems that may be disturbing your sleep.

Is Snoring a Problem?

Long the material for jokes, snoring is generally accepted as common and annoying in adults but as nothing to worry about. However, snoring is no laughing matter. Frequent, loud snoring is often a sign of sleep apnea and may increase your risk of developing cardiovascular disease and diabetes. Snoring also may lead to daytime sleepiness and impaired performance.

Snoring is caused by a narrowing or partial blockage of the airways at the back of your mouth, throat, or nose. This obstruction results in increased air turbulence when breathing in, causing the soft tissues in your upper airways to vibrate. The end result is a noisy snore that can disrupt the sleep of your bed partner. This narrowing of the airways is typically caused by the soft palate, tongue, and throat relaxing while you sleep, but allergies or sinus problems also can contribute to a narrowing of the airways, as can being overweight and having extra soft tissue around your upper airways.

The larger the tissues in your soft palate (the roof of your mouth in the back of your throat), the more likely you are to snore while sleeping. Alcohol or sedatives taken shortly before sleep also promote snoring. These drugs cause greater relaxation of the tissues in your throat and mouth. Surveys reveal that about one-half of all adults snore, and 50 percent of these adults do so loudly and frequently. African Americans, Asians, and Hispanics are more likely to snore loudly and frequently compared with Caucasians, and snoring problems increase with age.

JIM

"My wife noticed that I snored loudly and sometimes stopped breathing in the middle of the night. She was the one who finally pushed me to see a doctor."

Not everyone who snores has sleep apnea, but people who have sleep apnea typically do snore loudly and frequently. Sleep apnea is a

serious sleep disorder, and its hallmark is loud, frequent snoring with pauses in breathing or shallow breaths while sleeping. (See "Sleep Apnea" on page 38.) Even if you don't experience these breathing pauses, snoring can still be a problem for you as well as for your bed partner. Snoring adds extra effort to your breathing, which can reduce the quality of your sleep and lead to many of the same health consequences as sleep apnea.

One study found that older adults who did not have sleep apnea, but who snored 6–7 nights a week, were more than twice as likely to report being extremely sleepy during the day than those who never snored. The more people snored, the more daytime fatigue they reported. That sleepiness may help explain why snorers are more likely to be in car crashes than people who don't snore. Loud snoring also can disrupt the sleep of bed partners and strain marital relations, especially if snoring causes the spouses to sleep in separate bedrooms.

In addition, snoring increases the risk of developing diabetes and heart disease. One study found that women who snored regularly were twice as likely as those who did not snore to develop diabetes, even if they were not overweight (another risk factor for diabetes). Other studies suggest that regular snoring may raise the lifetime risk of developing high blood pressure, heart failure, and stroke.

About one-third of all pregnant women begin snoring for the first time during their second trimester. If you are snoring while pregnant, let your doctor know. Snoring in pregnancy can be associated with high blood pressure and can have a negative effect on your baby's growth and development. Your doctor will keep a close eye on your blood pressure throughout your pregnancy and can let you know if any additional evaluations for the snoring might be useful. In most cases, the snoring and any related high blood pressure will go away shortly after delivery.

Snoring also can be a problem in children. As many as 10–15 percent of young children, who typically have enlarged adenoids and tonsils (both tissues in the throat), snore on a regular basis. Several studies show that children who snore (with or without sleep apnea) are more likely than those who do not snore to score lower on tests that measure intelligence, memory, and attention span. These children also have more problematic behavior, including hyperactivity. The end result is that children who snore don't perform in

school as well as those who do not snore. Strikingly, snoring was linked to a greater drop in IQ than that seen in children who had elevated levels of lead in their blood. Although the behavior of children improves after they stop snoring, studies suggest they may continue to get poorer grades in school, perhaps because of lasting effects on the brain linked to the snoring. You should have your child evaluated by your doctor if the child snores loudly and frequently—three to four times a week—especially if you note brief pauses in breathing while asleep and if there are signs of hyperactivity or daytime sleepiness, inadequate school achievement, or slower than expected development.

Surgery to remove the adenoids and tonsils of children often can cure their snoring and any associated sleep apnea. Such surgery has been linked to a reduction in hyperactivity and improved ability to pay attention, even in children who showed no signs of sleep apnea before surgery.

Snoring in older children and adults may be relieved by less invasive measures, however. These measures include losing weight, refraining from use of tobacco, sleeping on the side rather than on the back, or elevating the head while sleeping. Treating chronic congestion and refraining from alcohol or sedatives before sleeping also may decrease snoring. In some adults, snoring can be relieved by dental appliances that reposition the soft tissues in the mouth. Although numerous over-the-counter nasal strips and sprays claim to relieve snoring, no scientific evidence supports those claims.

Common Sleep Disorders

A number of sleep disorders can disrupt your sleep quality and make you overly sleepy during the day, even if you spent enough time in bed to be well rested. (See "Common Signs of a Sleep Disorder" on page 34.)

More than 70 sleep disorders affect at least 40 million Americans and account for an estimated $16 billion in medical costs each year, not counting costs due to lost work time, car accidents, and other factors.

The four most common sleep disorders are insomnia, sleep apnea, restless legs syndrome, and narcolepsy. Additional sleep problems include chronic insufficient sleep, circadian rhythm abnormalities, and "parasomnias" such as sleep walking, sleep paralysis, and night terrors.

LAUREN

"My restless legs syndrome made me lose sleep and affected my quality of life. But I'm in a good place right now. I'm taking the right medicine for me, and I've adopted a healthy, active lifestyle. I am very passionate about taking control of my health."

Common Signs of a Sleep Disorder

Look over this list of common signs of a sleep disorder, and talk to your doctor if you have any of them on three or more nights a week:

- It takes you more than 30 minutes to fall asleep at night.
- You awaken frequently in the night and then have trouble falling back to sleep again.
- You awaken too early in the morning.
- You often don't feel well rested despite spending 7–8 hours or more asleep at night.
- You feel sleepy during the day and fall asleep within 5 minutes if you have an opportunity to nap, or you fall asleep unexpectedly or at inappropriate times during the day.
- Your bed partner claims you snore loudly, snort, gasp, or make choking sounds while you sleep, or your partner notices that your breathing stops for short periods.
- You have creeping, tingling, or crawling feelings in your legs that are relieved by moving or massaging them, especially in the evening and when you try to fall asleep.
- You have vivid, dreamlike experiences while falling asleep or dozing.
- You have episodes of sudden muscle weakness when you are angry or fearful, or when you laugh.
- You feel as though you cannot move when you first wake up.
- Your bed partner notes that your legs or arms jerk often during sleep.
- You regularly need to use stimulants to stay awake during the day.

Also keep in mind that, although children can show some of these signs of a sleep disorder, they often do not show signs of excessive daytime sleepiness. Instead, they may seem overactive and have difficulty focusing and concentrating. They also may not do their best in school.

Insomnia

Insomnia is defined as having trouble falling asleep or staying asleep, or as having unrefreshing sleep despite having ample opportunity to sleep. Life is filled with events that occasionally cause insomnia for a short time. Such temporary insomnia is common and is often brought on by situations such as stress at work, family pressures, or a traumatic event. A National Sleep Foundation poll of adults in the United States found that close to half of the respondents reported temporary insomnia in the nights immediately after the terrorist attacks on September 11, 2001.

Chronic insomnia is defined as having symptoms at least 3 nights per week for more than 1 month. Most cases of chronic insomnia are secondary, which means they are due to another disorder or medications. Primary chronic insomnia is a distinct sleep disorder; its cause is not yet well understood. About 30–40 percent of adults say they have some symptoms of insomnia within any given year, and about 10–15 percent of adults say they have chronic insomnia. Chronic insomnia becomes more common with age, and women are more likely than men to report having insomnia.

Insomnia often causes problems during the day, such as extreme sleepiness, fatigue, a lack of energy, difficulty concentrating, depressed mood, and irritability. Thus, untreated insomnia can impair quality of life as much as, or more than, other chronic medical problems.

Chronic insomnia is often caused by one or more of the following:

- A disease or mood disorder. The most common causes of insomnia are depression and/or anxiety disorders. Neurological disorders, such as Alzheimer's or Parkinson's disease, also can have insomnia as a symptom. Chronic insomnia can result from thyroid dysfunction, arthritis, asthma, or other medical conditions in which symptoms become more troublesome at night, making it difficult to fall asleep or stay asleep.
- Various prescribed and over-the-counter medications that can disrupt sleep, such as decongestants, certain pain relievers, and steroids.

- Sleep-disrupting behavior such as drinking alcohol, exercising shortly before bedtime, ingesting caffeine late in the day, watching TV or reading while in bed, or irregular sleep schedules due to shift work or other causes.
- Another sleep disorder, such as sleep apnea or restless legs syndrome.

Some people, however, have primary chronic insomnia. This condition is linked to a tendency to be more "revved up" than normal (hyperarousal). People who have primary chronic insomnia may have heightened levels of certain hormones, higher body temperatures, faster heart rates, and a different pattern of brain waves while they sleep.

Doctors diagnose insomnia based mainly on sleep history, often by reviewing a sleep diary. An overnight sleep recording may be required if another sleep disorder is suspected. Doctors also will try to diagnose and treat any other underlying medical or psychological problems as well as identify behaviors that might be causing the insomnia.

Often, people who have insomnia enter into a vicious cycle—because they've had trouble sleeping on previous nights, they become anxious at the slightest sign that they may not be falling asleep right away. That anxiety can make it more difficult for them to fall asleep. The more time they spend in bed not sleeping, and watching the clock, the more their anxiety—and sleeplessness—increases.

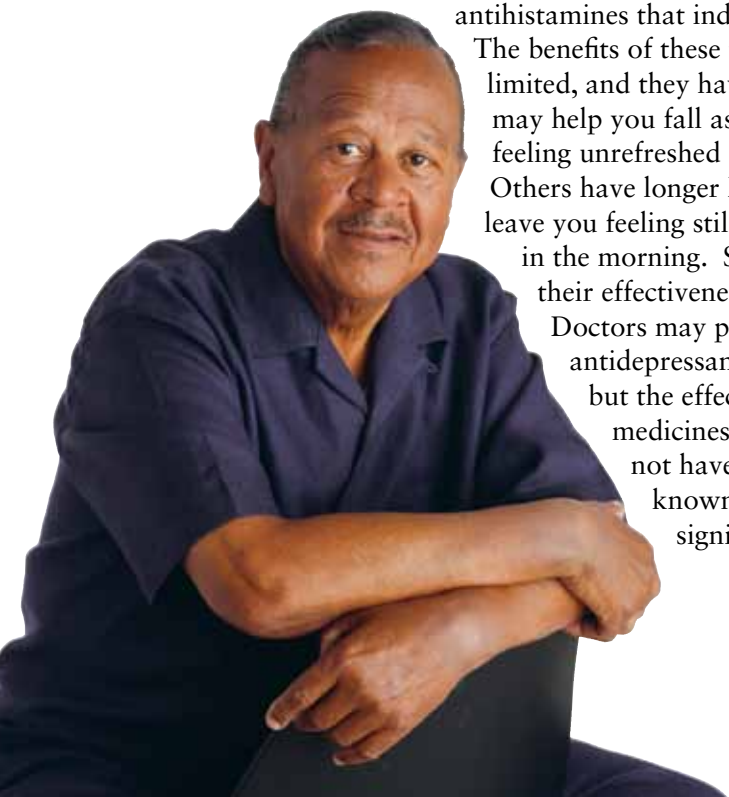
To break that cycle of anxiety and negative conditioning, experts recommend going to bed only when you're sleepy. If you can't fall asleep (or fall back to sleep) within 20 minutes, get out of bed, go into another room, and do a relaxing activity (such as reading) until you feel sleepy again. Then return to bed. Studies have shown that this reconditioning therapy is an effective way to treat insomnia.

Relaxation therapy is another strategy that works for some people who have insomnia. Relaxation therapy may include meditation and other mental relaxation techniques. It also may include physical relaxation techniques, such as progressively tensing and then relaxing each of the muscle groups in your body before sleep. Another method is to focus on breathing deeply. Relaxation therapy can help your body and mind slow down so that you can fall asleep more easily at bedtime.

Sleep restriction therapy also works for some people who have insomnia. Calculate your average sleep time over the course of a week, and then limit your nightly sleep time to that average. Gradually add more sleep time each night until you achieve a more normal night's sleep. You should avoid daytime naps longer than 15–20 minutes during sleep restriction therapy. Napping can make it harder to fall asleep at night, which may prolong insomnia. In addition, during sleep restriction therapy, avoid driving a car or operating dangerous machinery until you are getting enough sleep at night.

All of these behavioral changes are part of a treatment called cognitive behavioral therapy. Cognitive behavioral therapy also can be used to replace negative thoughts about sleep, such as "I'll never fall asleep without sleeping pills," with more realistic positive thinking. Cognitive behavioral therapy is effective in most people who have chronic insomnia.

Some people who have chronic insomnia that is not corrected by behavioral therapy or treatment of an underlying condition may need a prescription medication. You should talk to a doctor before trying to treat insomnia with alcohol, over-the-counter or prescribed short-acting sedatives, or sedating antihistamines that induce drowsiness. The benefits of these treatments are limited, and they have risks. Some may help you fall asleep but leave you feeling unrefreshed in the morning. Others have longer lasting effects and leave you feeling still tired and groggy in the morning. Some also may lose their effectiveness over time. Doctors may prescribe sedating antidepressants for insomnia, but the effectiveness of these medicines in people who do not have depression is not known, and there are significant side effects.



To treat their insomnia, some people pursue "natural" remedies, such as melatonin supplements or valerian teas or extracts. These remedies are available over the counter. Little evidence exists that melatonin can help relieve insomnia. Studies with valerian also have been inconclusive, and the actual dose and purity of various supplements, extracts, or teas that contain valerian may vary from product to product. In addition, because melatonin, valerian, and other natural remedies are not regulated by the Food and Drug Administration, their safety is not monitored.

Sleep Apnea

In people who have sleep apnea (also referred to as sleep-disordered breathing), breathing briefly stops or becomes very shallow during sleep. This change is caused by intermittent blocking of the upper airway, usually when the soft tissue in the rear of the throat collapses and partially or completely closes the airway. Each pause in breathing typically lasts 10–120 seconds and may occur 20–30 times or more each sleeping hour.

If you have sleep apnea, not enough air can flow into your lungs through your mouth and nose during sleep, even though breathing efforts continue. When this happens, the amount of oxygen in your blood decreases. Your brain responds by awakening you enough to tighten the upper airway muscles and open your windpipe. Normal breaths then start again, often with a loud snort or choking sound. Although people who have sleep apnea typically snore loudly and frequently, not everyone who snores has sleep apnea. (See "Is Snoring a Problem?" on page 30.)

Because people who have sleep apnea frequently go from deeper sleep to lighter sleep during the night, they rarely spend enough time in deep, restorative stages of sleep. They are therefore often excessively sleepy during the day. Such sleepiness is thought to lead to mood and behavior problems, including depression, and it more than triples the risk of being in a traffic or work-related accident.

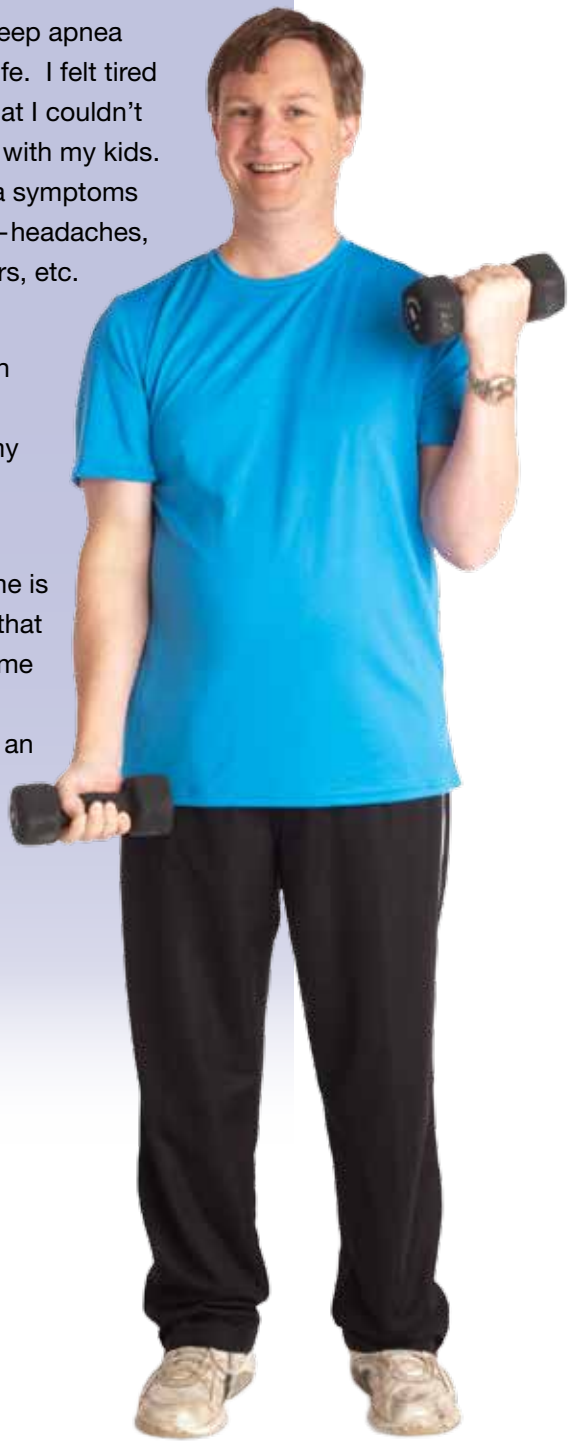
The many brief drops in blood-oxygen levels that occur during the night can result in morning headaches and trouble concentrating, thinking clearly, learning, and remembering. Additionally, the intermittent oxygen drops and reduced sleep quality together trigger the release of stress hormones. These hormones raise your blood pressure and heart rate and boost the risk of heart attack, stroke, irregular heartbeats, and congestive heart failure. In addition,

JIM

"I realize now that my sleep apnea affected my quality of life. I felt tired all the time—so tired that I couldn't exercise or spend time with my kids. I had other sleep apnea symptoms that affected my work—headaches, confusion, making errors, etc.

"Looking back, I know that I should have taken it more seriously and told my doctor about my symptoms many years before I did.

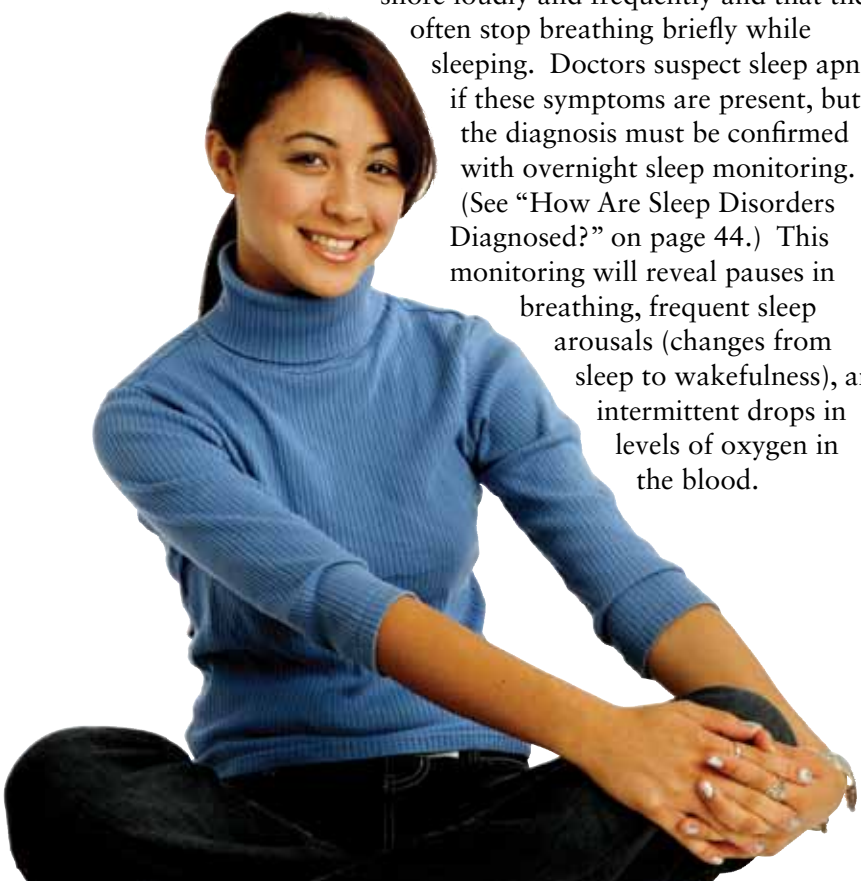
"One thing that helps me is physical activity. Now that I am feeling better, I come home from work with enough energy to have an exercise routine."



untreated sleep apnea can lead to changes in energy metabolism (the way your body changes food and oxygen into energy) that increase the risk for developing obesity and diabetes.

Anyone can have sleep apnea. It is estimated that at least 12–18 million American adults have sleep apnea, making it as common as asthma. More than one-half of the people who have sleep apnea are overweight. Sleep apnea is more common in men. More than 1 in 25 middle-aged men and 1 in 50 middle-aged women have sleep apnea along with extreme daytime sleepiness. About 3 percent of children and 10 percent or more of people over age 65 have sleep apnea. This condition occurs more frequently in African Americans, Asians, Native Americans, and Hispanics than in Caucasians.

More than one-half of all people who have sleep apnea are not diagnosed. People who have sleep apnea generally are not aware that their breathing stops in the night. They just notice that they don't feel well rested when they wake up and are sleepy throughout the day. Their bed partners are likely to notice, however, that they snore loudly and frequently and that they often stop breathing briefly while sleeping. Doctors suspect sleep apnea if these symptoms are present, but the diagnosis must be confirmed with overnight sleep monitoring. (See "How Are Sleep Disorders Diagnosed?" on page 44.) This monitoring will reveal pauses in breathing, frequent sleep arousals (changes from sleep to wakefulness), and intermittent drops in levels of oxygen in the blood.



Like adults who have sleep apnea, children who have this disorder usually snore loudly, snort or gasp, and have brief pauses in breathing while sleeping. Small children often have enlarged tonsils and adenoids that increase their risk for sleep apnea. But doctors may not suspect sleep apnea in children because, instead of showing the typical signs of sleepiness during the day, these children often become agitated and may be considered hyperactive. The effects of sleep apnea in children may include poor school performance and difficult, aggressive behavior.

A number of factors can make a person susceptible to sleep apnea. These factors include:

- Throat muscles and tongue that relax more than normal while asleep
- Enlarged tonsils and adenoids
- Being overweight—the excess fat tissue around your neck makes it harder to keep the throat area open
- Head and neck shape that creates a somewhat smaller airway size in the mouth and throat area
- Congestion, due to allergies, that also can narrow the airway
- Family history of sleep apnea

If your doctor suspects that you have sleep apnea, you may be referred to a sleep specialist. Some of the ways to help diagnose sleep apnea include:

- A medical history that includes asking you and your family questions about how you sleep and how you function during the day.
- Checking your mouth, nose, and throat for extra or large tissues—for example, checking the tonsils, uvula (the tissue that hangs from the middle of the back of the mouth), and soft palate (the roof of your mouth in the back of your throat).
- An overnight recording of what happens with your breathing during sleep (polysomnogram, or PSG).
- A multiple sleep latency test (MSLT), usually done in a sleep center, to see how quickly you fall asleep at times when you would normally be awake. (Falling asleep in only a few minutes usually means that you are very sleepy during the day. Being very sleepy during the day can be a sign of sleep apnea.)

Once all the tests are completed, the sleep specialist will review the results and work with you and your family to develop a treatment plan. Changes in daily activities or habits may help reduce your symptoms:

- **Sleep on your side instead of on your back.** Sleeping on your side will help reduce the amount of upper airway collapse during sleep.
- **Avoid alcohol, smoking, sleeping pills, herbal supplements, and any other medications that make you sleepy.** They make it harder for your airways to stay open while you sleep, and sedatives can make the breathing pauses longer and more severe. Tobacco smoke irritates the airways and can help trigger the intermittent collapse of the upper airway.
- **Lose weight if you are overweight.** Even a little weight loss can sometimes improve symptoms.

These changes may be all that are needed to treat mild sleep apnea. However, if you have moderate or severe sleep apnea, you will need additional, more direct treatment approaches.

Continuous positive airway pressure (CPAP) is the most effective treatment for sleep apnea in adults. A CPAP machine uses mild air pressure to keep your airways open while you sleep. The machine delivers air to your airways through a specially designed nasal mask. The mask does not breathe for you; the flow of air creates increased pressure to keep the airways in your nose and mouth more open while you sleep. The air pressure is adjusted so that it is just enough to stop your airways from briefly becoming too small during sleep. The pressure is constant and continuous. Sleep apnea will return if CPAP is stopped or if it is used incorrectly.

People who have severe sleep apnea symptoms generally feel much better once they begin treatment with CPAP. CPAP treatment can cause side effects in some people. Possible side effects include dry or stuffy nose, irritation of the skin on the face, bloating of the stomach, sore eyes, or headaches. If you have trouble with CPAP side effects, work with your sleep specialist and support staff. Together, you can do things to reduce or eliminate these problems.

Currently, no medications cure sleep apnea. However, some prescription medications may help relieve the excessive sleepiness that sometimes persists even with CPAP treatment of sleep apnea.

JIM

"My doctor prescribed CPAP (continuous positive airway pressure) for me, but it was not easy to use at first. Sleeping with a CPAP machine was uncomfortable for me, so I didn't use it like I should have—rarely, if at all. One day at work, I started feeling really bad, so I went to the hospital. The doctors told me that since I had not been using CPAP regularly, not enough oxygen was going to my brain, which caused symptoms like those for a stroke. So, I went back to my doctor and got a different CPAP machine that was more comfortable for me.

"It's important to talk with your health care provider to make sure that your treatment is comfortable and works for you."

Another treatment approach that may help some people is the use of a mouthpiece (oral or dental appliance). If you have mild sleep apnea or do not have sleep apnea but snore very loudly, your doctor or dentist also may recommend this. A custom-fitted plastic mouthpiece will be made by a dentist or an orthodontist (a specialist in correcting teeth or jaw problems). The mouthpiece will adjust your lower jaw and tongue to help keep the airway in your throat more open while you are sleeping. Air can then flow more easily into your lungs because there is less resistance to breathing. Following up with the dentist or orthodontist is important to correct any side effects and to be sure that your mouthpiece continues to fit properly. It is also important to have a followup sleep study to see whether your sleep apnea has improved.

Some people who have sleep apnea may benefit from surgery; this depends on the findings of the evaluation by the sleep specialist. Removing tonsils and adenoids that are blocking the airway is done frequently, especially in children. Uvulopalatopharyngoplasty (UPPP) is a surgery for adults that removes the tonsils, uvula, and part of the soft palate. Tracheostomy is a surgery used rarely and only in severe sleep apnea when no other treatments have been successful. A small hole is made in the windpipe, and a tube is inserted. Air will flow through the tube and into the lungs, bypassing the obstruction in the upper airway.

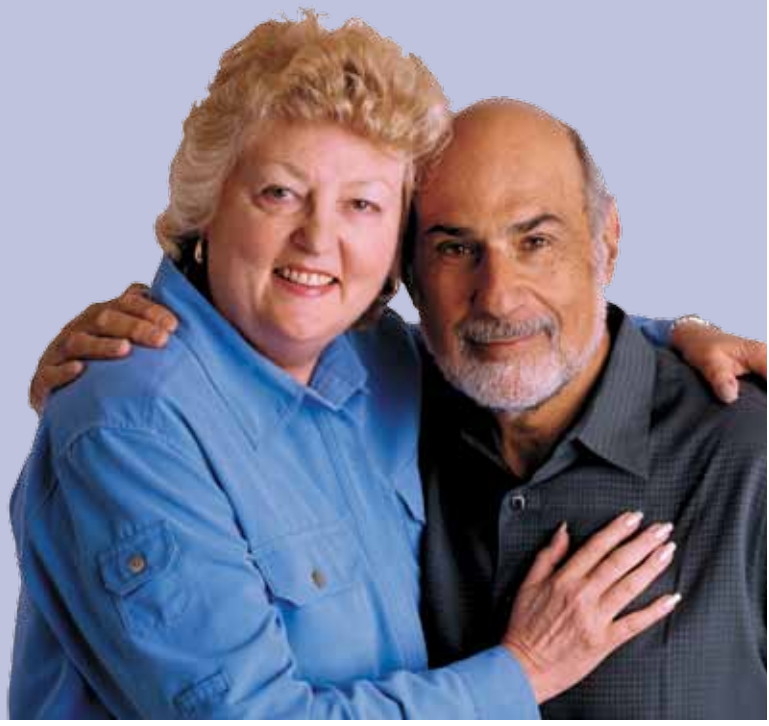
How Are Sleep Disorders Diagnosed?

Depending on your symptoms, your doctor will gather information and consider several possible tests when trying to diagnose a sleep disorder:

- **Sleep history and sleep log.** Your doctor will ask you how many hours you sleep each night, how often you awaken during the night and for how long, how long it takes you to fall asleep, how well rested you feel upon awakening, and how sleepy you feel during the day. Your doctor may ask you to keep a sleep diary for a few weeks. (See "Sample Sleep Diary" on page 54.) Your doctor also may ask you whether you have any symptoms of sleep apnea or restless legs syndrome, such as loud snoring, snorting or gasping, morning headaches, tingling or unpleasant sensations in the limbs that are relieved by moving them, and jerking of the limbs during sleep. Your sleeping partner may be asked whether you have some of these symptoms, as you may not be aware of them yourself.
- **Sleep recording in a sleep laboratory (polysomnogram).** A sleep recording or polysomnogram (PSG) is usually done while you stay overnight at a sleep center or sleep laboratory. Electrodes and other monitors are placed on your scalp, face, chest, limbs, and finger. While you sleep, these devices measure your brain activity, eye movements, muscle activity, heart rate and rhythm, blood pressure, and how much air moves in and out of your lungs. This test also checks the amount of oxygen in your blood. A PSG test is painless. In certain circumstances, the PSG can be done at home. A home monitor can be used to record heart rate, how air moves in and out of your lungs, the amount of oxygen in your blood, and your breathing effort.
- **Multiple sleep latency test (MSLT).** This daytime sleep study measures how sleepy you are and is particularly useful for diagnosing narcolepsy. The MSLT is conducted in a sleep

laboratory and typically done after an overnight sleep recording (PSG). In this test, monitoring devices for sleep stage are placed on your scalp and face. You are asked to nap four or five times for 20 minutes every 2 hours during the day. Technicians note how quickly you fall asleep and how long it takes you to reach various stages of sleep, especially REM sleep, during your naps. Normal individuals either do not fall asleep during these short designated naptimes or take a long time to fall asleep. People who fall asleep in less than 5 minutes are likely to require treatment for a sleep disorder, as are those who quickly reach REM sleep during their naps.

It is important to have a sleep specialist interpret the results of your PSG or MSLT. See “How To Find a Sleep Center and Sleep Specialist” on page 56.



LAUREN

"I started to get weird feelings in my legs at night while I slept. To feel better, I would get up and move around and stretch. Then the weird feelings began to happen more often and made me lose sleep. I started to think that something was wrong. I decided to go to the doctor and was diagnosed with restless legs syndrome (RLS).

"Because RLS symptoms can change, I'm always trying to find the right mix of diet, medication, and exercise. Exercise and massage help me manage my RLS. Yoga helps a lot too, because of all the stretching involved."

Restless Legs Syndrome

Restless legs syndrome (RLS) causes an unpleasant prickling or tingling in the legs, especially in the calves, that is relieved by moving or massaging them. People who have RLS feel a need to stretch or move their legs to get rid of the uncomfortable or painful feelings. As a result, it may be difficult to fall asleep and stay asleep. One or both legs may be affected. Some people also feel the sensations in their arms. These sensations also can occur when lying down or sitting for long periods of time, such as while at a desk, riding in a car, or watching a movie.

Many people who have RLS also have brief limb movements during sleep, often with abrupt onset, occurring every 5–90 seconds. This condition, known as periodic limb movements in sleep (PLMS), can repeatedly awaken people who have RLS, reducing their total sleep time and interrupting their sleep. Some people have PLMS but have no abnormal sensations in their legs while awake.

RLS affects 5–15 percent of Americans, and its prevalence increases with age. RLS occurs more often in women than men. One study found that RLS accounted for one-third of the insomnia seen in patients older than age 60. Children also can have RLS. In children, the condition may be associated with symptoms of attention-deficit hyperactivity disorder. However, it's not fully known how the disorders are related. Sometimes "growing pains" can be mistaken for RLS.

RLS is often inherited. Pregnancy, kidney failure, and anemia related to iron or vitamin deficiency can trigger or worsen RLS symptoms. Researchers suspect that these conditions cause an iron deficiency that results in a lack of dopamine, which is used by the brain to control physical sensation and limb movements. Doctors usually can diagnose RLS by patients' symptoms and a telltale worsening of symptoms at night or while at rest. Some doctors may order a blood test to check ferretin levels (ferretin is a form of iron). Doctors also may ask people who have RLS to spend a night in a sleep laboratory, where they are monitored to rule out other sleep disorders and to document the excessive limb movements.

RLS is treatable but not always curable. Dramatic improvements are seen quickly when patients are given dopamine-like drugs or iron supplements. Alternatively, people who have milder cases may be treated successfully with sedatives or behavioral strategies. These

strategies include stretching, taking a hot bath, or massaging the legs before bedtime. Avoiding caffeinated beverages also can help reduce symptoms, and certain medications (e.g., some antidepressants, particularly selective serotonin reuptake inhibitors) may cause RLS. If iron or vitamin deficiency underlies RLS, symptoms may improve with prescribed iron, vitamin B12, or folate supplements. Some people may require anticonvulsant medications to control the creeping and crawling sensations in their limbs. Others who have severe symptoms that are associated with another medical disorder or that do not respond to normal treatments may need to be treated with pain relievers.

Narcolepsy

Narcolepsy's main symptom is extreme and overwhelming daytime sleepiness, even after adequate nighttime sleep. In addition, nighttime sleep may be fragmented by frequent awakenings. People who have narcolepsy often fall asleep at inappropriate times and places. Although TV sitcoms occasionally feature these individuals to generate a few laughs, narcolepsy is no laughing matter. People who have narcolepsy experience daytime "sleep attacks" that last from seconds to more than one-half hour, can occur without warning, and may cause injury. These embarrassing sleep spells also can make it difficult to work and to maintain normal personal or social relationships.

With narcolepsy, the usually sharp distinctions between being asleep and awake are blurred. Also, people who have narcolepsy tend to fall directly into dream-filled REM sleep, rather than enter REM sleep gradually after passing through the non-REM sleep stages first.

In addition to overwhelming daytime sleepiness, narcolepsy has three other commonly associated symptoms, but these may not occur in all people:

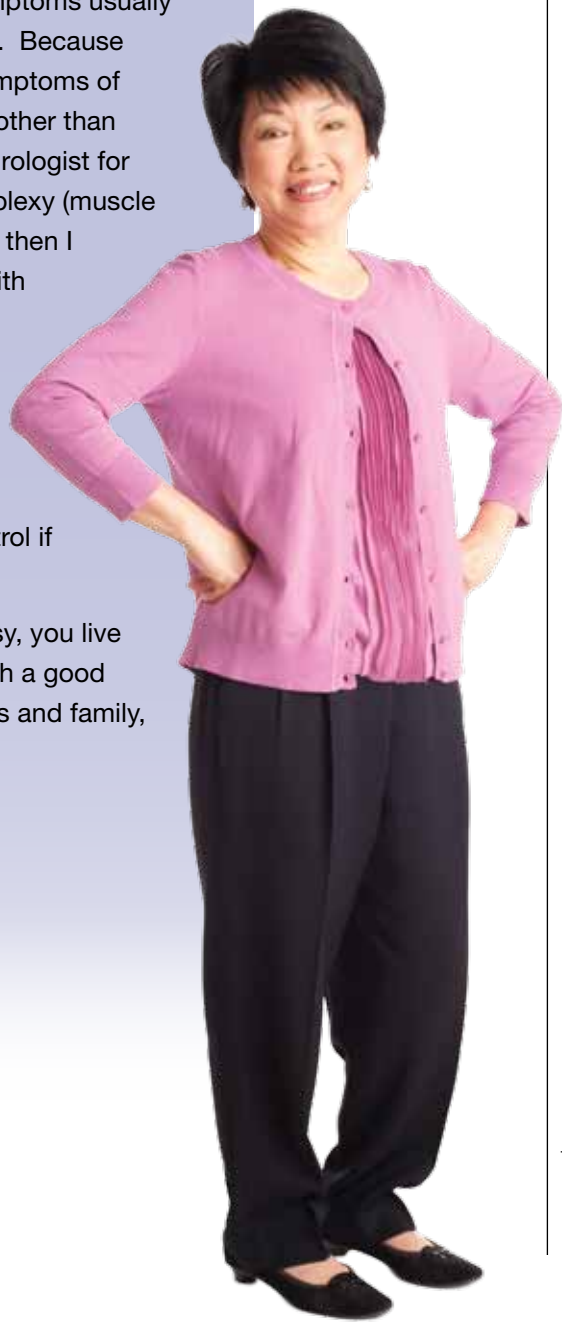
- **Sudden muscle weakness (cataplexy).** This weakness is similar to the paralysis that normally occurs during REM sleep, but it lasts a few seconds to minutes while an individual is awake. Cataplexy tends to be triggered by sudden emotional reactions, such as anger, surprise, fear, or laughter. The weakness may show up as limpness at the neck, buckling of the knees, or sagging facial muscles affecting speech, or it may cause a complete body collapse.

SZE-PING

"At first, I was misdiagnosed with chronic fatigue syndrome, because I was in my forties and narcolepsy symptoms usually start during the teen years. Because I didn't have any of the symptoms of chronic fatigue syndrome other than sleepiness, I went to a neurologist for help. He noticed the cataplexy (muscle weakness) right away, and then I was officially diagnosed with narcolepsy and then later on with borderline sleep apnea.

"Even though there is no cure for narcolepsy, you can feel like you have control if you manage it well.

"When you have narcolepsy, you live your life differently. But with a good plan and supportive friends and family, it all turns out OK."



- **Sleep paralysis.** People who have narcolepsy may experience a temporary inability to talk or move when falling asleep or waking up, as if they were glued to their beds.
- **Vivid dreams.** These dreams can occur when people who have narcolepsy first fall asleep or wake up. The dreams are so lifelike that they can be confused with reality.

Experts estimate that as many as 350,000 Americans have narcolepsy, but fewer than 50,000 are diagnosed. The disorder may be as widespread as Parkinson's disease or multiple sclerosis, and more prevalent than cystic fibrosis, but it is less well known. Narcolepsy is often mistaken for depression, epilepsy, or the side effects of medicines.

Narcolepsy can be difficult to diagnose in people who have only the symptom of excessive daytime sleepiness. It is usually diagnosed during an overnight sleep recording (PSG) that is followed by an MSLT. (See "How Are Sleep Disorders Diagnosed?" on page 44.) Both tests reveal symptoms of narcolepsy—the tendency to fall asleep rapidly and enter REM sleep early, even during brief naps.

Narcolepsy can develop at any age, but the symptoms tend to appear first during adolescence or early adulthood. About 1 of every 10 people who have narcolepsy has a close family member who has the disorder, suggesting that one can inherit a tendency to develop narcolepsy. Studies suggest that a substance in the brain called hypocretin plays a key role in narcolepsy. Most people who have narcolepsy lack hypocretin, which promotes wakefulness. Scientists believe that an autoimmune reaction—perhaps triggered by disease, viral illness, or brain injury—specifically destroys the hypocretin-generating cells in the brains of people who have narcolepsy.

Eventually, researchers may develop a treatment for narcolepsy that restores hypocretin to normal levels. In the meantime, most people who have narcolepsy find some to all of their symptoms relieved by various drug treatments. For example, central nervous system stimulants can reduce daytime sleepiness. Antidepressants and other drugs that suppress REM sleep can prevent muscle weakness, sleep paralysis, and vivid dreaming. Doctors also usually recommend that people who have narcolepsy take short naps (10–15 minutes) two or three times a day, if possible, to help control excessive daytime sleepiness.

Parasomnias (Abnormal Arousals)

In some people, the walking, talking, and other body functions normally suppressed during sleep occur during certain sleep stages. Alternatively, the paralysis or vivid images usually experienced during dreaming may persist after awakening. These occurrences are collectively known as parasomnias and include confusional arousals (a mixed state of being both asleep and awake), sleep talking, sleep walking, night terrors, sleep paralysis, and REM sleep behavior disorder (acting out dreams). Most of these disorders—such as confusional arousals, sleep walking, and night terrors—are more common in children, who tend to outgrow them once they become adults. People who are sleep-deprived also may experience some of these disorders, including sleep walking and sleep paralysis. Sleep paralysis also commonly occurs in people who have narcolepsy. Certain medications or neurological disorders appear to lead to other parasomnias, such as REM sleep behavior disorder, and these parasomnias tend to occur more in elderly people. If you or a family member has persistent episodes of sleep paralysis, sleep walking, or acting out of dreams, talk with your doctor. Taking measures to assure the safety of children and other family members who have partial arousals from sleep is very important.

LAWRENCE

"It's a scary experience, lying in bed, wanting to get up, but unable to—scary enough to almost make you not want to go to sleep anymore. I can remember, as a child, feeling as though there was a weight on me when I was trying to wake up, and I couldn't move. When I would try to wake up, I would kick my legs and flail my arms, sometimes bumping my wife. I really didn't have control over my limbs.

"When the symptoms got really bad, I went to a sleep specialist, who told me I had sleep paralysis. My doctor prescribed a medicine that has worked great for me. Now, I rarely have sleep paralysis—maybe 3 times per year."

Do You Think You Have a Sleep Disorder?

At various points in our lives, all of us suffer from a lack of sleep that can be corrected by making sure we have the opportunity to get enough sleep. But, if you are spending enough time in bed and still wake up tired or feel very sleepy during the day, you may have a sleep disorder. See "Common Signs of a Sleep Disorder" on page 34.

One of the best ways you can tell whether you are getting enough good-quality sleep, and whether you have signs of a sleep disorder, is by keeping a sleep diary. (See "Sample Sleep Diary" on page 54.) Use this diary to record the quality and quantity of your sleep; your use of medications, alcohol, and caffeinated beverages; your exercise patterns; and how sleepy you feel during the day. After a week or so, look over this information to see how many hours of sleep or nighttime awakenings one night are linked to your being tired the next day. This information will give you a sense of how much uninterrupted sleep you need to avoid daytime sleepiness. You also can use the diary to see some of the patterns or practices that may keep you from getting a good night's sleep.

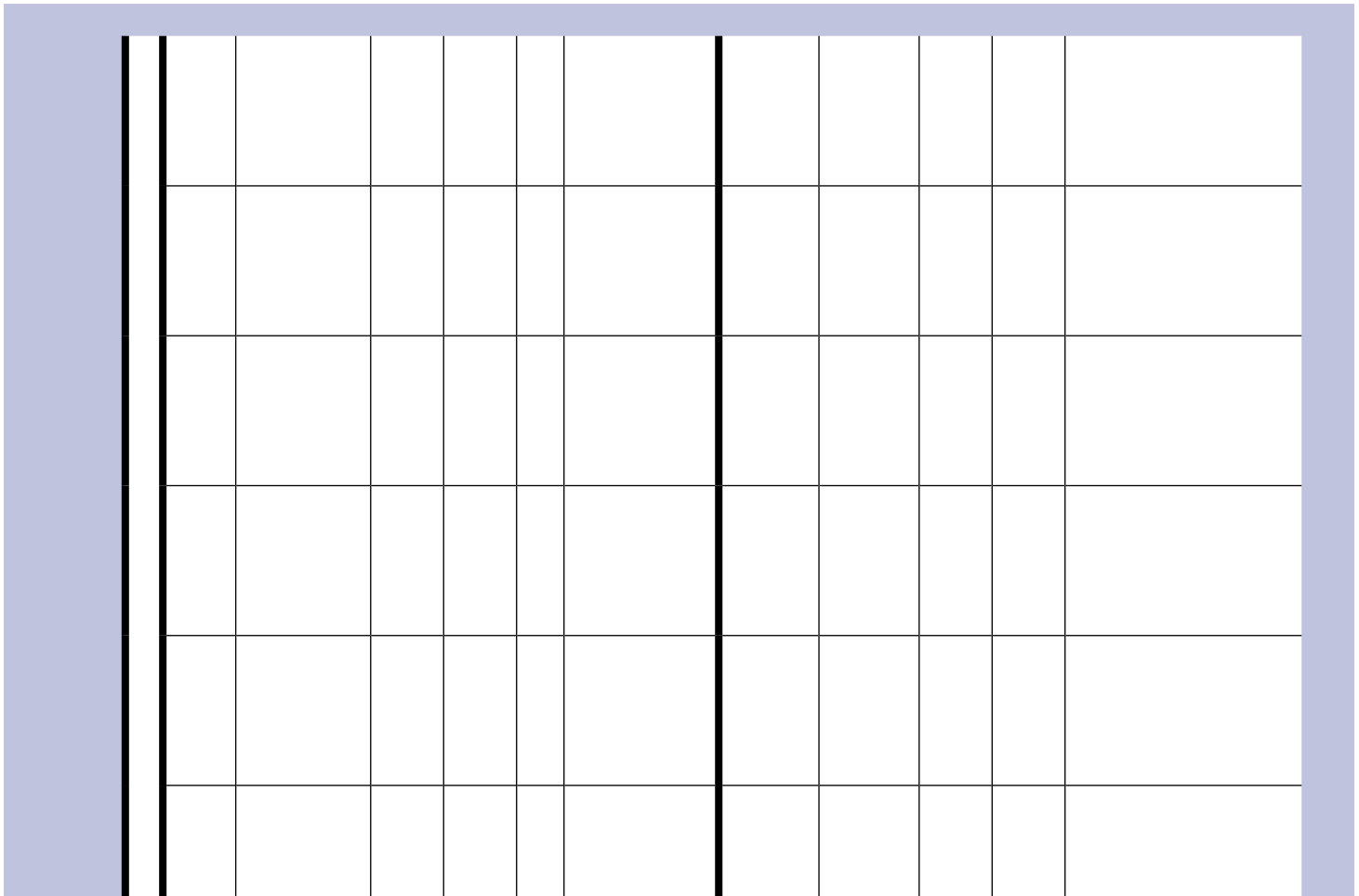
You may have a sleep disorder and should see your doctor if your sleep diary reveals any of the following:

- You consistently take more than 30 minutes each night to fall asleep.
- You consistently awaken more than a few times or for long periods of time each night.
- You take frequent naps.
- You often feel sleepy during the day—or you fall asleep at inappropriate times during the day.

Sample **Sleep Diary**

	Name:				
Complete in the Morning	Today's date (include month/day/year):	Monday*			
	Time I went to bed last night: Time I woke up this morning: No. of hours slept last night:	11 p.m. 7 a.m. 8			
	Number of awakenings and total time awake last night:	5 times 2 hours			
	How long I took to fall asleep last night:	30 mins.			
	Medications taken last night:	None			
	How awake did I feel when I got up this morning? 1—Wide awake 2—Awake but a little tired 3—Sleepy	2			
Complete in the Evening	Number of caffeinated drinks (coffee, tea, cola) and time when I had them today:	1 drink at 8 p.m.			
	Number of alcoholic drinks (beer, wine, liquor) and time when I had them today:	2 drinks 9 p.m.			
	Naptimes and lengths today:	3:30 p.m. 45 mins.			
	Exercise times and lengths today:	None			
	How sleepy did I feel during the day today? 1—So sleepy had to struggle to stay awake during much of the day 2—Somewhat tired 3—Fairly alert 4—Wide awake	1			

* This column shows example diary entries—use as a model for your own diary notes.



How To Find a Sleep Center and Sleep Specialist

If your doctor refers you to a sleep center or sleep specialist, make sure that center or specialist is qualified to diagnose and treat your sleep problem. To find sleep centers accredited by the American Academy of Sleep Medicine, go to www.aasmnet.org and click on "Find a Sleep Center" (under the Patients & Public menu), or call 708–492–0930. To find sleep specialists certified by the American Board of Sleep Medicine, go to www.absm.org and click on "Verification of Diplomates of the ABSM."

Research

Researchers have learned a lot about sleep and sleep disorders in recent years. That knowledge has led to a better understanding of the importance of sleep to our lives and our health. Research supported by the National Heart, Lung, and Blood Institute (NHLBI) has helped identify some of the causes of sleep disorders and their effects on the heart, brain, lungs, and other body systems. The NHLBI also supports ongoing research on the most effective ways to diagnose and treat sleep disorders.

Many questions remain about sleep and sleep disorders. The NHLBI continues to support a range of research that focuses on:

- Better understanding of how a lack of sleep increases the risk for obesity, diabetes, heart disease, and stroke
- New ways to diagnose sleep disorders
- Genetic, environmental, and social factors that lead to sleep disorders
- The adverse effects from a lack of sleep on body and brain

Much of this research depends on the willingness of volunteers to participate in clinical research. If you would like to help researchers advance science on sleep or about a sleep disorder you have and possible treatments, talk to your doctor about participating in clinical research. (For more information, see "Clinical Research" on page 58.)

Clinical Research

Researchers can learn quite a bit about sleep and sleep disorders by studying animals. However, to fully understand sleep and its affect on health and functioning, as well as how best to diagnose and treat sleep disorders, researchers need to do clinical research on people. This type of research is called clinical research because it is often conducted in clinical settings, such as hospitals or doctors' offices.

The two types of clinical research are clinical trials and clinical studies.

- **Clinical trials** test new ways to diagnose, prevent, or treat various disorders. For example, treatments (such as medicines, medical devices, surgery, or other procedures) for a disorder need to be tested in people who have the disorder. A trial helps determine whether a treatment is safe and effective in humans before it is made available for public use. In a clinical trial, participants are randomly assigned to groups. One group receives the new treatment being tested. Other groups may receive a different treatment or a placebo (an inactive substance resembling a drug being tested). Comparing results from the groups gives researchers confidence that changes in the test group are due to the new treatment and not to other factors.

- **Other types of clinical studies** are done to discover the factors, including environmental, behavioral, or genetic factors, that cause or worsen various disorders. Researchers may follow a group of people over time to learn what factors contribute to becoming sick.

Clinical studies and trials may be relatively brief, or may last for years and require many visits to the study sites. These sites usually are university hospitals or research centers, but they can include private doctors' offices and community hospitals.

If you participate in clinical research, the research will be explained to you in detail, you will be given a chance to ask questions, and you will be asked to provide written permission. You may not directly benefit from the results of the clinical research you participate in, but the information gathered will help others and will add to scientific knowledge. Taking part in clinical research has other benefits, as well. You'll learn more about your disorder, you'll have the support of a team of health care providers, and your health will likely be monitored closely. However, participation also can have risks, which you should discuss with your doctor. No matter what you decide, your regular medical care will not be affected.

If you're thinking about participating in a clinical study, you may have questions about the purpose of the study, the types of tests and treatment involved, how participation will affect your daily life, and whether any costs are involved. Your doctor may be able to answer some of your questions and help you find clinical studies in which you can participate. You also can visit the following Web sites to learn about being in a study and to search for clinical trials being done on your disorder:

- www.clinicaltrials.gov
- http://clinicalresearch.nih.gov
- www.nhlbi.nih.gov/studies/index.htm

Clinical Research

For More Sleep Information

Resources From the National Heart, Lung, and Blood Institute (NHLBI)

National Center on Sleep Disorders Research
Division of Lung Diseases, NHLBI
Two Rockledge Centre, Suite 10170
6701 Rockledge Drive
Bethesda, MD 20895–7952
Phone: 301–435–0199
Fax: 301–480–3451
Web site: www.nhlbi.nih.gov/sleep

NHLBI Diseases and Conditions Index (DCI)
The DCI includes articles on sleep disorders, tests, and procedures, along with videos, podcasts, and Spanish-language articles.
Web site: www.nhlbi.nih.gov/health/dci/index.html

NHLBI Health Information Center
P.O. Box 30105
Bethesda, MD 20824–0105
Telephone: 301–592–8573
TTY: 240–629–3255
Fax: 301–592–8563
E-mail: nhlbiinfo@nhlbi.nih.gov
Web site: www.nhlbi.nih.gov

NIH Office of Science Education Web site (for high school supplemental curriculum: Sleep, Sleep Disorders, and Biological Rhythms)
http://science.education.nih.gov

Resources From Other Sleep Organizations

American Academy of Sleep Medicine (AASM)
2510 North Frontage Road
Darien, IL 60561
Telephone: 630–737–9700
Fax: 630–737–9790
Web site: www.aasmnet.org

American Sleep Apnea Association
6856 Eastern Avenue, NW., Suite 203
Washington, DC 20012
Telephone: 202–203–3650
Fax: 202–293–3656
Web site: www.sleepapnea.org

Narcolepsy Network
P.O. Box 294
Pleasantville, NY 10570
Telephone: 401–667–2523
Fax: 401–633–6567
E-mail: narnet@narcolepsynetwork.org
Web site: www.narcolepsynetwork.org

National Sleep Foundation
1010 North Glebe Road, Suite 310
Arlington, VA 22201
Telephone: 703–243–1697
E-mail: nsf@sleepfoundation.org
Web site: www.sleepfoundation.org

Restless Legs Syndrome Foundation
1610 14th Street, NW., Suite 300
Rochester, MN 55901
Telephone: 507–287–6465
Fax: 507–287–6312
E-mail: rlsfoundation@rls.org
Web site: www.rls.org

Notes

Notes

Discrimination Prohibited: Under provisions of applicable public laws enacted by Congress since 1964, no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity (or, on the basis of sex, with respect to any education program or activity) receiving Federal financial assistance. In addition, Executive Order 11141 prohibits discrimination on the basis of age by contractors and subcontractors in the performance of Federal contracts, and Executive Order 11246 states that no federally funded contractor may discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Therefore, the National Heart, Lung, and Blood Institute must be operated in compliance with these laws and Executive Orders.

U.S. Department of Health and Human Services
National Institutes of Health

National Heart
Lung and Blood Institute

NIH Publication No. 11-5271
Originally printed November 2005
Revised August 2011

ISBN 1-933236-04-3
90000
9 781933 236049